1 Background, Purpose and Need

1.1 Introduction

The City and County of Honolulu Department of Transportation Services (DTS), in cooperation with the U.S. Department of Transportation Federal Transit Administration (FTA), are evaluating alternatives that would provide high-capacity transit service on O‘ahu. The primary project study area is the travel corridor between Kapolei and the University of Hawai‘i at Mānoa (UH Mānoa) (Figure 1-1). This corridor includes the majority of housing and employment on O‘ahu. The east-west length of the corridor is approximately 23 miles. The north-south width is at most 4 miles, because much of the corridor is bounded by the Ko‘olau and Wai‘anae Mountain Ranges to the north and the Pacific Ocean to the south.

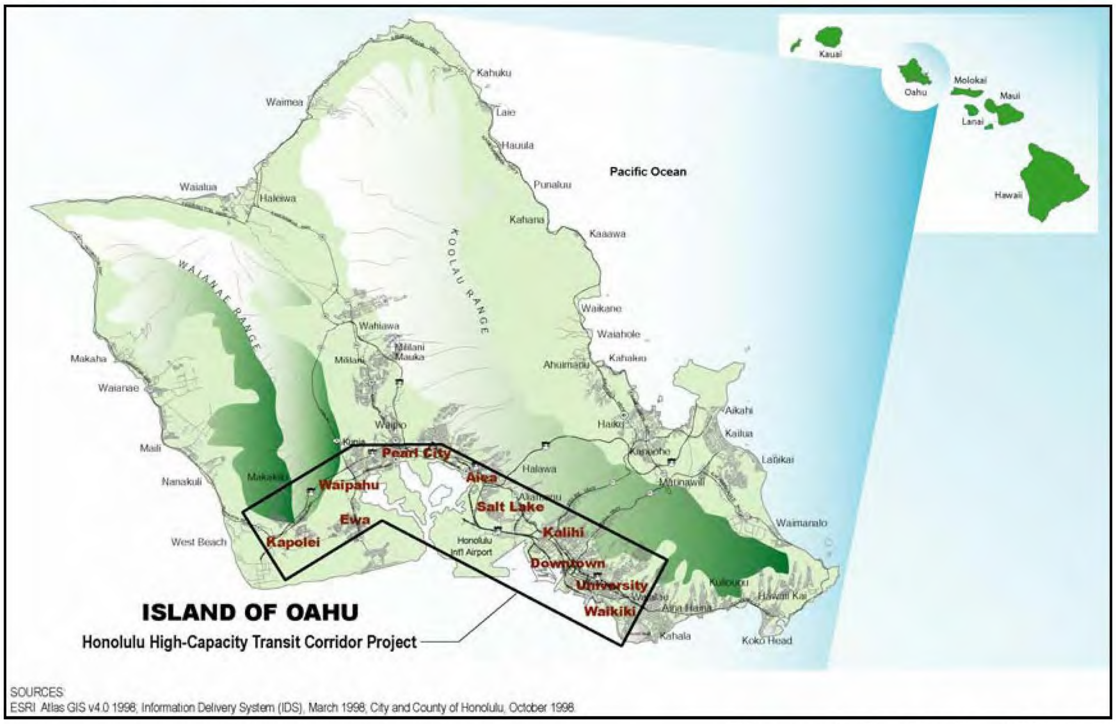

Figure 1-1. Project Vicinity

1.2 History

Transit has a long history on O‘ahu starting with the O‘ahu Railway and Land (OR&L) system that carried passengers on approximately 150 miles of track between 1890 and 1947. The route structure included a line in the corridor between ‘Ewa and Honolulu (Chiddix and Simpson, 2004). The Honolulu Rapid Transit and Land (HRT&L) system began operating an electric streetcar system in Honolulu in 1903 and had more than 20 miles of lines in operation during its peak. The population of O‘ahu was 59,000 in 1900, increasing to 120,000 by 1920.

Roadway development, buses, and private automobile ownership decreased rail-transit demand beginning in the 1920s. Buses were less expensive to operate than rail-transit. They operated on city streets that were developed and maintained with taxpayer funds, compared to the railways, which had to be privately developed and maintained. The HRT&L streetcars were completely replaced by buses in 1942. Increasing transportation demand was met in the 1950s with development of Interstate Route H-1 (H-1 Freeway).

The population of Oʻahu continued to increase, growing from 350,000 people in 1950 to 500,000 in 1960 and 630,000 by 1970. However, despite increasing travel demand, public opposition to extensive freeway expansion began to develop in the early 1960s. A proposal for an elevated Makai Freeway was abandoned. The island-wide Oʻahu Transportation Study that was completed in 1967 concluded that a fixed-guideway transit system, serving a corridor between Pearl City and Hawaiʻi Kai, would provide cost-effective transportation capacity as part of a larger transportation system expansion needed to meet increased demand (OTPP, 1967).

During the early 1970s, the Preliminary Engineering and Evaluation Program (PEEP) I and PEEP II studies further explored options for a fixed-guideway transit system. Based on these studies, the City and County of Honolulu began planning the Honolulu Area Rail Rapid Transit (HART) project to provide transit in the corridor identified in the 1967 study (Pearl City to Hawaiʻi Kai). In 1982, project planning, environmental analysis, and preliminary engineering culminated in a Final Environmental Impact Statement issued by the City and the Urban Mass Transportation Administration (UMTA was the predecessor to the current FTA). However, a change in city administration resulted in changed transportation priorities and work on the HART project stopped. Oʻahu's population continued to increase (in 1980 Oʻahu's population was 760,000).

In 1985, the City partnered with UMTA to begin a new study for an exclusive right-of-way, fixed-guideway rapid transit project. The Honolulu Rapid Transit Development Project (HRT) built on the planning completed for the HART project, but explored new automated transit technologies. When the Alternatives Analysis/Draft Environmental Impact Statement (AA/Draft EIS) for the project was completed in 1990, the island's population had grown to 840,000 people.

Later in 1990, following completion of the AA/Draft EIS, the State Legislature passed funding acts to provide State funds and authorize the City to impose a general use and excise tax surcharge to provide local funding for the project. Local funding was needed to leverage the federal funds that the U.S. Congress would make available for the project. The City selected a grade-separated, fixed-guideway transit alternative that included a tunnel under Downtown, and FTA authorized the City to proceed to preliminary engineering for this alternative (the Locally Preferred Alternative, or LPA).

Over the following two years, the City conducted additional engineering studies and issued a request for proposals to construct the system. Soil conditions in the Downtown area and updated financing and environmental impact information resulted in an amendment to the LPA. The project was changed to follow Nimitz Highway on an elevated structure, and a branch line to Waikīkī was eliminated. The FTA and the City issued a Supplemental Draft EIS to address the amended LPA and the addition of several park-and-ride lots to the project. In 1992, a Final EIS was issued for the project. However, the City Council failed to authorize the general use and excise tax surcharge to provide the local funding and the project collapsed. Federal funds allocated to Honolulu were diverted to cities on the mainland.

During this planning, and while O‘ahu's population was steadily increasing, the number of trips taken, or "transportation demand," was increasing at a greater rate than population growth. In 1960, 134,000 automobiles were registered on O‘ahu and residents made a total of 1,190,000 daily person trips. Eleven percent of those trips were made by transit (OTPP, 1967). In 1980, 2,170,000 daily person trips were made and 8 percent of those were made by transit (OMPO, 1984). By 1990, there were 613,000 automobiles registered on O‘ahu. Residents made 2,410,000 daily person trips and only 7 percent of the trips were made by transit (OMPO, 1995). Between 1960 and 1990, the population of O‘ahu increased by 68 percent, while the number of daily person trips more than doubled and the number of vehicles registered on the island increased almost five-fold.

In 1998, the City began developing the O‘ahu Trans 2K Islandwide Mobility Concept Plan. Through an intensive public involvement program, the Plan identified the increasing need for improved mobility and links between land use and transportation. The plan endorsed an integrated transportation approach, with roadway, high-occupancy vehicle, and transit improvements. Once again the need for high-capacity, frequent transit service was identified for the Primary Urban Center. This study led to the Primary Corridor Transportation Project.

Unlike prior projects, the Primary Corridor Transportation Project focused on alternatives that could be constructed within existing transportation rights-of-way to provide mobility improvements at a lower cost and with fewer impacts. A Major Investment Study and Draft EIS was completed in 2000, which proposed a system based on bus rapid transit (BRT) operations. The BRT system continued to be developed and refined into the LPA addressed in the Final EIS in 2002. The proposed system included Regional and In-Town BRT operations extending from Kapolei to Waikīkī and UH Mānoa.

Some of the Regional and In-Town BRT facilities from the BRT system proposal have been completed. The Hawai‘i Department of Transportation has implemented the extension of the morning "zipper lane" between Radford Drive and the Ke‘ehi Interchange. In-Town BRT facilities that have been constructed include seven transit stops and the reconstruction of Kūhiō Avenue between Kalākaua and Kapahulu Avenues.

The 2030 O‘ahu Regional Transportation Plan includes the afternoon "zipper lane" that was also proposed as part of the Regional BRT project. This facility will be included in the No Build Alternative and all other alternatives analyzed for this Honolulu High-Capacity Transit Corridor Project. Other elements of the Primary Corridor Transportation Project, such as transit centers, are part of the 2030 O'ahu Regional Transportation Plan.

Between 1990 and 2000 the island experienced travel demand growth that again outstripped population growth, with a 5 percent increase in residents and a 15 percent increase in trips. The population of O'ahu in 2000 was 880,000; residents made 2,760,000 daily person trips; and transit continued to carry 7 percent of the total trips (OMPO, 2001).

Transportation demand has continued to increase on O'ahu since 2000. As part of its work to update the Regional Transportation Plan, OMPO surveyed O'ahu residents about transportation issues in 2004. The survey identified commute-period traffic congestion in the 'Ewa and Central O'ahu to Downtown Honolulu corridor as the greatest concern. Nearly twice as many residents responded that improving transit was more important than building more roadways. Seventy percent of the respondents believed that rail rapid transit should be constructed as a long-term transportation solution, and 55 percent supported raising taxes to provide local funding for the system.

During the summer of 2005, the State legislature recognized the need and public support for a high-capacity transit system on O'ahu and passed Act 247. The Act authorized the County to levy a general excise tax surcharge to construct and operate a mass transit project serving O'ahu. The City Council subsequently adopted Ordinance 05-027 to levy a tax surcharge to fund public transportation. With secure local funding established for the first time, the City began the AA process to analyze the feasibility of a high-capacity transit system in the corridor between Kapolei and UH Mānoa. A range of alternatives was evaluated and screened to select alternatives that would provide the most improvement to person-mobility and travel reliability in the study corridor.

FTA published a Notice of Intent to Prepare an AA in the *Federal Register* on December 7, 2005, and DTS published an EIS Preparation Notice in the State of Hawai'i *Environmental Notice* on December 8, 2005. The public was asked to comment on the proposed alternatives, the purpose and need for the project, and the range of issues to be evaluated at a series of scoping meetings in December 2005. Scoping activities related to the planning AA and the Hawai'i Revised Statutes Chapter 343 process were completed in December 2005 and January 2006.

DTS completed a planning Alternatives Analysis in October 2006 that evaluated the four following alternatives to provide high-capacity transit service in the travel corridor between Kapolei and UH Mānoa:

- No Build
- Transportation System Management
- Express Buses Operating in Managed Lanes
- Fixed Guideway Transit System

After review of the Alternatives Analysis Report and consideration of nearly 3,000 comments received from the public, the City Council selected an LPA on December 22, 2006. The selection was signed into law by the Mayor on January 6, 2007, becoming Ordinance 07-001, which selected a fixed-guideway transit system extending from Kapolei to UH Mānoa with a connection to Waikīkī. The ordinance authorizes the City to proceed to planning and engineering a fixed-guideway project within these limits and following the alignment defined in the ordinance. Also, the First Project must be fiscally constrained to anticipated funding sources. City Council Resolution 07-039 defined the First Project as extending from East Kapolei to Ala Moana Center via Salt Lake Boulevard.

The notice of intent to prepare this EIS appeared in the *Federal Register* on March 15, 2007, and scoping was concluded in April 2007.

1.3 Description of the Corridor

The Honolulu High-Capacity Transit Corridor extends from Kapolei in the west (Wai'anae or 'Ewa direction) to UH Mānoa in the east (Koko Head direction), and is confined by the Wai'anae and Ko'olau Mountain Ranges to the north (mauka direction) and the Pacific Ocean to the south (makai direction). Between Pearl City and 'Aiea, the corridor's width is less than one mile between the Pacific Ocean and the base of the Ko'olau Mountains.

The General Plan for the City and County of Honolulu directs future population and employment growth to the 'Ewa and Primary Urban Center Development Plan areas and the Central O'ahu Sustainable Communities Plan area. The largest increases in population and employment are projected in the 'Ewa, Waipahu, Downtown, and Kaka'ako districts, which are all located in the corridor (Figure 1-2). Major activity centers in the corridor are shown in Figure 1-3.

Figure 1-2. Areas and Districts in the Study Corridor

In 2000, 63 percent of the population of 876,200 and 81 percent of the employment of 499,300 on O'ahu were located within the study corridor. By 2030 this distribution will increase to 69 percent of the population and 84 percent of the employment as development continues to be concentrated into the Primary Urban Center (PUC) and 'Ewa Development Plan areas. These trends are shown in

Figure 1-4 and Figure 1-5, which illustrate existing and year 2030 projected population of 1,117,300 and employment of 632,900, respectively, by transportation analysis area.

Kapolei is the center of the ‘Ewa Development Plan area and has been designated O‘ahu’s “second city.” City and State government offices have opened in Kapolei and the University of Hawai‘i is developing a master plan for a new West O‘ahu campus there. The Kalaeloa Community Development District (formerly known as Barbers Point Naval Air Station) covers 3,700 acres adjacent to Kapolei and is planned for redevelopment. The Department of Hawaiian Home Lands is also a major landowner in the area and has plans for residential and retail development. In addition, developers have several proposals to continue the construction of residential subdivisions.

Continuing Koko Head, the corridor follows Farrington and Kamehameha Highways through a mixture of low-density commercial and residential development. This part of the corridor passes through the makai portion of the Central O‘ahu Sustainable Communities Plan area.

Farther Koko Head, the corridor enters the Primary Urban Center Development Plan area, which is bounded by commercial and residential densities that begin to increase in the vicinity of Aloha Stadium. The Pearl Harbor Naval Reserve, Hickam Air Force Base, and Honolulu International Airport border the corridor on the makai side. Military and civilian housing are the dominant land uses mauka of the H-1 Freeway, with a concentration of high-density housing along Salt Lake Boulevard.

As the corridor continues Koko Head across Moanalua Stream, land use becomes increasingly dense. Industrial and port land uses dominate along the harbor, shifting to a mix of low-rise commercial, residential and institutional uses along Dillingham Boulevard, a mixture of residential and commercial uses along North King Street, and primarily residential use mauka of the H-1 Freeway.

Koko Head of Nu‘uanu Stream, the corridor continues through Chinatown and Downtown. The Chinatown and Downtown areas, with 62,300 jobs, have the highest employment density in the corridor. The Kaka‘ako and Ala Moana neighborhoods, comprised historically of low-rise industrial and commercial uses, are being revitalized with a mix of high-rise residential towers and mixed use commercial/retail and entertainment development. Ala Moana Center, both a major transit hub and shopping destination, is served by more than 2,000 weekday bus trips and visited by more than 56 million shoppers annually.

The corridor continues to Waikīkī and through the McCully neighborhood to the University of Hawai‘i. Today, Waikīkī has more than 20,000 residents and provides more than 44,000 jobs. It is one of the densest tourist areas in the world, serving approximately 72,000 visitors daily (DBEDT, 2003). UH Mānoa is the other major destination at the Koko Head end of the corridor. It has an enrollment of more than 20,000 students and approximately 6,000 staff (UH, 2005). Approximately 60 percent of students do not live within walking distance of campus (UH, 2002) and must travel by vehicle or transit to attend classes.

1.3.1 Travel Patterns in the Corridor

The vast majority of trips made on the island occur within the study corridor. Currently, morning travel patterns in the corridor are heavily directional. Morning town-bound (Koko Head direction) traffic volumes through the Waipahu and ‘Aiea areas are more than twice the volume traveling in the ‘Ewa direction. Afternoon flows are less directional with ‘Ewa-bound traffic volumes about 50 percent greater than town-bound (Koko Head-bound) traffic.

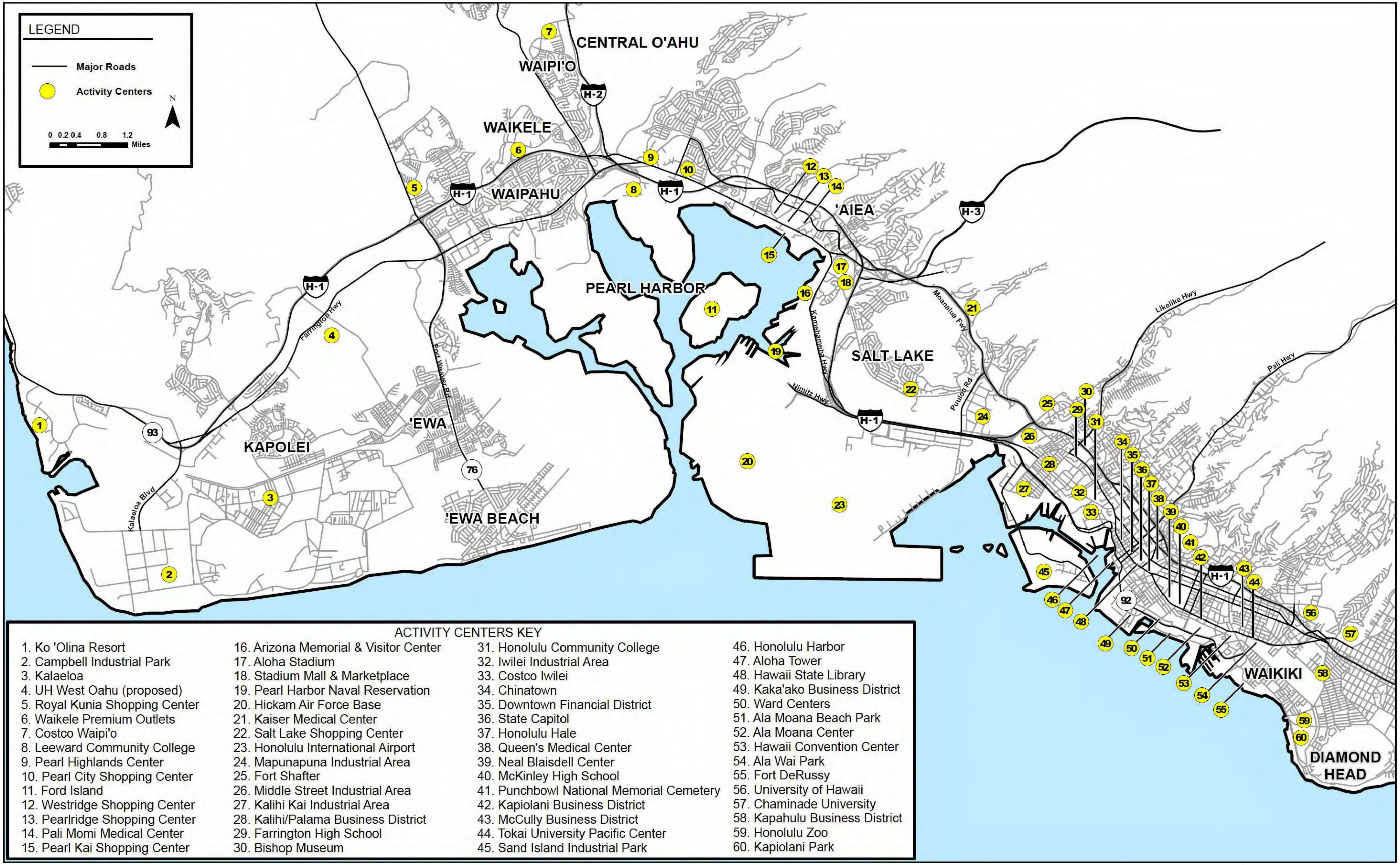

Figure 1-3. Major Activity Centers in the Study Corridor

Figure 1-4. Population Distribution for O‘ahu
Figure 1-5. Employment Distribution for O‘ahu

Trip origins correlate closely with the level of population in a given area, while trip destinations correlate to a high degree with the level of employment. Based on these data, 1,826,000 or 68 percent of the 2,698,000 islandwide daily trips and 335,000, or 64 percent of the 523,000 peak-period work-related trips are currently generated within the study corridor. The study corridor attracts an even higher percentage of islandwide trips with 2,092,000, or 78 percent of daily trips and 424,000 or 82 percent of peak-period work-related trips having destinations within the study corridor.

More trips will originate and remain within the Primary Urban Center in 2030 than they do today. However, the greatest increases in trips will be to and from the ‘Ewa Development Plan area. These patterns illustrate the continued transportation importance of the study corridor with peak-period travel becoming less directional and more work trips destined for Kapolei.

Transit Travel Patterns

An on-board transit survey was conducted on all of TheBus routes in December 2005 and January 2006. Information obtained from the survey included the origins and destinations of current transit bus users across a variety of trip purposes for both the 178,400 total daily trips and the 57,000 peak-period work trips. These survey data indicate that the substantial majority of trips made by transit on the island occur within the study corridor.

When compared to total travel, the current number of transit trips within the corridor as a percentage of total islandwide transit trips is even more pronounced. Based on the survey data, 83 percent of both islandwide daily and peak-period work-related trips originate within the study corridor; while the study corridor attracts 90 percent of total islandwide daily trips and 94 percent of peak-period work-related trips.

Daily Transit Trips

The major destinations for weekday bus riders are Downtown (20 percent) and the Punchbowl-Sheridan-Date area (18 percent). Downtown contains the region’s highest concentration of jobs. Punchbowl-Sheridan-Date also contains a high number of jobs, as well as Ala Moana Center, the state’s largest shopping complex.

Overall, the largest share of TheBus riders’ trips originates in Waikīkī (16.5 percent). The major destinations for these trips are Downtown (24 percent) and Punchbowl-Sheridan-Date (27 percent). In addition to Waikīkī, Punchbowl-Sheridan-Date (9 percent), Kāhala-Pālolo (8 percent), and Pauoa-Kalihi (9 percent) are the origins of a large number of trips. These areas are densely populated, with relatively high concentrations of transit-dependent households (Figure 1-6).

Figure 1-6. Concentrations of Transit-dependent Households

Peak-Period Transit Work Trips

Nearly 34 percent of all peak-period work trips are destined to Downtown, while Punchbowl-Sheridan-Date and Waikīkī each are destinations for about 12.5 percent of trips. Combined, these areas are the destinations of approximately 60 percent of the islandwide peak-period home-based work trips. Waikīkī, Punchbowl-Sheridan-Date, Pauoa-Kalihi, Waipahu-Waikele-Kunia, and Kāhala-Pālolo together account for about 50 percent of the home-based origins for work trips taken during the peak period on TheBus.

1.4 Existing Transportation Facilities and Services in the Corridor

The study corridor is currently served by roadway and transit systems, as well as parking, pedestrian, and bicycle facilities. Existing development throughout the study corridor, combined with the previously described geographic boundaries, limits the potential for new roadways or expansion of existing facilities.

1.4.1 Street and Highway System

The study corridor is served primarily by the H-1 Freeway, Farrington Highway, Kamehameha Highway, Nimitz Highway, and Moanalua Road (Route H201). The H-2 Freeway provides access to the corridor from Central O‘ahu, and the H-3 Freeway provides access to the corridor from the Windward side. Because of the constraints posed by geography and existing development, the expansion of existing roadways or the addition of new roadways in many sections of the corridor would be extremely difficult and/or expensive. As a result, some sections of the corridor are served by a relatively small number of facilities, and the lack of redundancy in the system at these locations can cause severe traffic problems should any of the facilities become overly congested or incapacitated. An example of this is in Pearl City where only three primary roadways, H-1 Freeway, Moanalua Road, and Kamehameha Highway, serve the high volume of traffic traversing this area. Of these roadways, the H-1 Freeway carries 70 to 75 percent of the a.m. and p.m. peak-hour traffic. Hence, when traffic is congested on the H-1 Freeway through this location, traffic is affected for miles along the adjacent corridor segments.

To better utilize the existing roadway facilities, both the Hawai‘i Department of Transportation (HDOT) and the City and County of Honolulu have implemented a number of roadway management strategies, including the use of contraflow lanes and high-occupancy vehicle (HOV) lanes. A contraflow lane is a strategy wherein a lane that typically provides vehicular travel in one direction is reversed during certain times of the day. Current contraflow lanes operate on the H-1 Freeway, Nimitz Highway, Kapi‘olani Boulevard, Ward Avenue, Atkinson Drive, and Wai‘alae Avenue during the a.m. peak period. During the p.m. peak period, contraflow lanes operate on Kapi‘olani Boulevard.

HOV lanes are freeway or surface street lanes designated for exclusive use by buses, carpools, and vanpools. HDOT operates HOV lanes on several state highways during certain times of the day. HOV lanes currently operate on the H-1 and H-2 Freeways, Moanalua Road, the H-1 Zipper Lane and Shoulder Express Lane, and Nimitz Highway.

1.4.2 Public Transit System

O'ahu Transit Services, Inc. (OTS) operates the public transit system (TheBus) on the island of O'ahu under contract to the City and County of Honolulu. TheBus system serves more than 80 percent of the developed areas of the island and carried approximately 73 million passenger trips in 2007 and experiences about 236,600 boardings on an average weekday. Annual transit passenger miles per-capita is higher in Honolulu than in all other major U.S. cities without a fixed guideway transit system.

1.4.3 Parking

Downtown Honolulu parking rates are high; however, many employers subsidize parking for their employees. Daily parking rates are the third-highest in the United States behind New York and Boston, while monthly parking rates are in the top 15 (Colliers, 2007). Downtown parking availability is considered limited, and garages have an average waiting list of three months for monthly parking. Parking availability also is limited in Waikīkī and near UH Mānoa.

1.5 Performance of the Existing Transportation System

1.5.1 Traffic Volumes

The highest daily traffic volumes occur near Downtown Honolulu. In 2007, more than 395,000 vehicles crossed Kapalama Canal daily. During the a.m. and p.m. peak hours, more than 26,000 vehicles cross Nu'uanu Stream each hour.

At the facility level, the Interstate Freeway system carries a considerable amount of the island's traffic, with the H-1 being the most heavily traveled freeway on O'ahu. At the Kalauao Stream screenline in Pearl City, approximately 20,000 and 17,000 vehicles currently travel on H-1 (both directions combined) during the a.m. and p.m. peak hours, respectively. Approximately 245,000 vehicles travel through this section of H-1 daily.

1.5.2 Traffic Operating Conditions

The operating conditions of a roadway can be represented by a variety of measures, including the volume-to-capacity (V/C) ratio, operating speeds, and the density of traffic on the facility. These measures can be used to determine level-of-service (LOS). A roadway's V/C ratio compares the volume of traffic traveling on the roadway to the physical capacity of the roadway. Speeds are typically a reflection of the amount of congestion on a roadway or its geometric design characteristics. Traffic density is measured in terms of vehicles per mile per lane and is a function of both volumes and speeds. LOS is measured on a grading scale from A through F for roadway operation; LOS A represents the best condition and LOS F represents more vehicles attempting to use a roadway than the capacity is able to accommodate.

In general, congested conditions (i.e., LOS E or F) occur during the a.m. and p.m. peak hours on many of the major roadways, particularly on segments of the H-1 Freeway from the Waiawa Interchange to the UH Mānoa area where stop-and-go conditions are typical. Signalized routes, such as Nimitz Highway, require more than one traffic signal cycle to clear intersections during peak periods. To avoid peak-hour congestion, motorists have changed their time of travel, resulting in extended peak traffic conditions. Weekday a.m. and p.m. peak traffic conditions generally last three to four hours each. Weekend traffic during the mid-day also resembles weekday peak-period conditions.

Recent traffic counts for the corridor indicate that existing travel conditions are congested during the a.m. peak hour for Koko Head-bound traffic crossing the Kalauao Stream in Pearl City (V/C ratio of 0.94 [LOS E]) and the Kapālama Canal closer to Downtown (V/C 0.94 [LOS E]). These conditions are also indicated by estimated travel speeds along H-1 in the corridor, as shown in Table 1-1. The table indicates that existing speeds between the Waiawa Interchange and Downtown in the general purpose lanes range from 14 to 20 miles per hour (mph) (LOS F) and will generally get worse by the year 2030 despite many planned roadway improvements. The only location where speeds in the corridor on the H-1 Freeway are predicted to increase in 2030 as compared to today is east of the Middle Street merge, where the addition of a lane is expected to result in an average a.m. peak period speed of 24 mph, which still indicates LOS F at this location.

Table 1-1. Existing and 2030 No Build Alternative A.M. Peak Period Speeds and Level-of-Service on H-1 Freeway

Based on recent traffic counts as well as field observations, the p.m. peak period is also experiencing a high level of congestion in the corridor. Analysis of operations at Kalauao Stream and Kapālama Canal show p.m. peak-hour levels-of-service of E for each; the H-1 Freeway is over capacity and operating at LOS F.

1.5.3 Transit Operating Conditions

The public transit system, TheBus, uses the general roadway network described above. The major factors influencing bus operating conditions are the traffic conditions under which the service operates, passenger loading time, and bus-stop spacing. Honolulu has substantial traffic congestion, high ridership and load factors, and closely spaced bus stops. Combined, these factors result in declining bus operating speeds over recent years, which are not competitive with the private automobile. Between 2002 and 2006, islandwide average bus speeds decreased 4 percent to 13.4 miles per hour. Because congestion in the study corridor is greater than in other parts of O‘ahu, the decrease in average bus speed in the corridor is greater than the islandwide average. To account for the congestion, OTS has lengthened the peak-period scheduled trip lengths by between 9 and 26 percent for several routes operating in the study corridor. Trip lengths for these typical routes serving various parts of O‘ahu are shown in Figure 1-7.

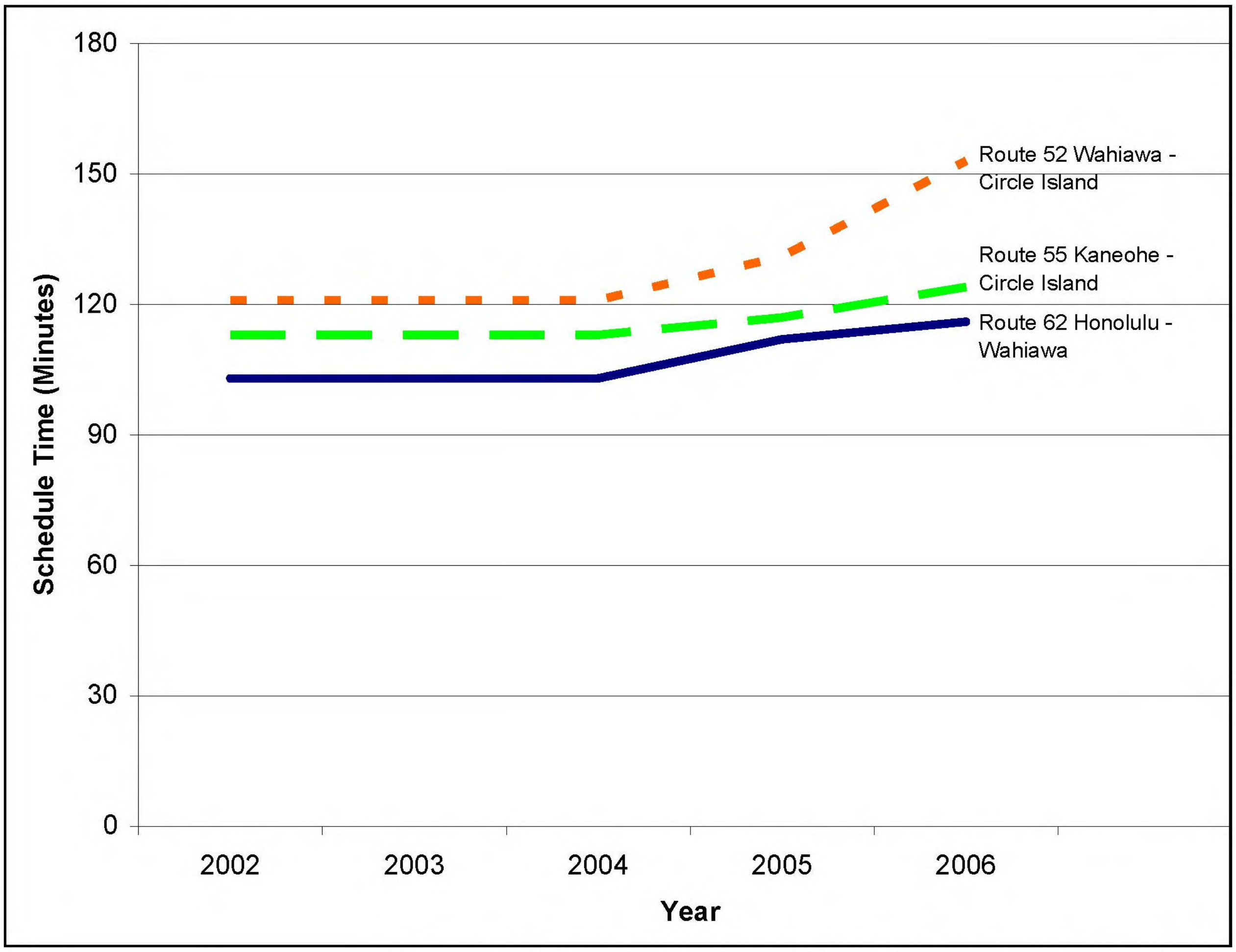

Figure 1-7. P.M. Peak-period Scheduled Bus Trip Times

Implementation of peak-period HOV lanes on the H-1 and H-2 Freeways, as well as the addition of the H-1 Freeway a.m. peak zipper lane, were intended to provide higher priority and mobility to buses and other high-occupancy vehicles. However, with a minimum eligibility requirement of only two persons per vehicle, these special lanes are often just as congested as the adjacent general purpose lanes (Table 1-1), thus negating much of the travel time advantage for transit buses.

As roadways become more congested, they become more susceptible to substantial delays caused by incidents, such as traffic accidents or heavy rain.

As a result, current transit schedules in the corridor are not reliable. Recent statistics from TheBus indicate that on a systemwide basis 27 percent of all buses were more than five minutes late. During the a.m. peak period, express buses were more than five minutes late 38 percent of the time (OTS, 2006).

Transit speed and reliability with mixed-traffic operations will continue to diminish in the corridor as the number of transit passengers increases and traffic volumes approach roadway capacity on more streets.

1.6 Potential Transit Markets

A comparison of the location and number of new employment opportunities in relation to population growth shows that many workers will still be required to travel to the Primary Urban Center for work (Figure 1-5). Despite the large growth of employment opportunities in the Kapolei area, population is projected to outpace and exceed the available employment in the area. Additionally, there will be a bidirectional flow of traffic throughout the day as more City and County administrative offices move their daily operations to Kapolei and other employment grows in the area. Both of these factors point to increased travel on the transportation system between Kapolei and the Primary Urban Center and represent an important potential future transit market.

Relatively large areas within the corridor are transit-dependent because they contain a large number of zero-car households relative to other parts of O‘ahu. Persons living in zero-car households are much more likely to use transit than other residents. These concentrations of zero-car household areas include much of the Primary Urban Center (including the Central Business District, Chinatown, Kaka‘ako, Kalihi-Pālama, and Iwilei) and some Waipahu neighborhoods, as indicated in Figure 1-6. These areas represent a robust transit market because they already rely on existing transit and are likely to use an improved system.

Finally, although the primary market for the transit corridor improvements are for the residents, the visitor industry and location of visitor attractions within the corridor combine to create a transit market for visitors traveling within the corridor. O‘ahu hosts more than 4.4 million visitors annually (DBEDT, 2005). Many of these visitors stay in the Waikīkī area and travel to points of interest outside of Waikīkī, including many of the activity centers in the corridor (Figure 1-3).

1.7 Purpose of the Project

The purpose of the Honolulu High-Capacity Transit Corridor Project is to provide high-capacity, high-speed transit in the highly congested east-west transportation corridor between Kapolei and UH Mānoa, as specified in the 2030 O‘ahu Regional Transportation Plan (ORTP). The project is intended to provide faster, more reliable public transportation services in the corridor than those currently operating in mixed-flow traffic, to provide basic mobility in areas of the corridor where people of limited income live, and to serve rapidly developing areas of the corridor. The project would also provide an alternative to private automobile travel and improve transit linkages within the corridor. Implementation of the project, in conjunction with other improvements included in the ORTP, would moderate anticipated traffic congestion in the corridor. The project also supports the goals of the Oʻahu General Plan and the ORTP by serving areas designated for urban growth.

1.8 Need for Transportation Improvements

1.8.1 Improved mobility for travelers facing increasingly severe traffic congestion

The existing transportation infrastructure in the corridor between Kapolei and UH Mānoa is overburdened handling current levels of travel demand. Motorists and transit users experience substantial traffic congestion and delay at most times of the day, both on weekdays and on weekends. Average weekday peak-period speeds on the H-1 Freeway are currently less than 20 mph in many places and will degrade even further by 2030. Transit vehicles are caught in the same congestion. In 2007, travelers on Oʻahu's roadways experienced 70,000 vehicle hours of delay, a measure of how much time is lost daily by travelers stuck in traffic, on a typical weekday. This measure of delay is projected to increase to more than 71,000 daily vehicle hours of delay by 2030, assuming implementation of all planned improvements listed in the ORTP (except for a fixed guideway system). Without these improvements, the ORTP indicates that daily vehicle-hours of delay could increase to as much as 326,000 vehicle hours.

Currently, motorists traveling from West Oʻahu to Downtown Honolulu experience highly congested traffic conditions during the a.m. peak period. By 2030, after including all of the planned roadway improvements in the ORTP, the level of congestion and travel time are projected to increase further. Average bus speeds in the corridor have been decreasing steadily as congestion has increased. "TheBus" travel times are projected to increase substantially through 2030. Within the urban core, most major arterial streets will experience increasing peak-period congestion, including Ala Moana Boulevard, Dillingham Boulevard, Kalākaua Avenue, Kapiʻolani Boulevard, King Street, and Nimitz Highway. Expansion of the roadway system between Kapolei and UH Mānoa is constrained by physical barriers and by dense urban neighborhoods that abut many existing roadways. Given the current and increasing levels of congestion, a need exists to offer an alternative method of travel within the corridor independent of current and projected highway congestion.

1.8.2 Improved transportation system reliability

As roadways become more congested, they become more susceptible to substantial delays caused by such incidents as traffic accidents or heavy rain. Even a single driver unexpectedly braking can have a ripple effect delaying hundreds of cars. Because of the operating conditions in the study corridor, current travel times are not reliable for either transit or automobile trips. To arrive at their destination on time, travelers must allow extra time in their schedules to account for the uncertainty of travel time. This lack of predictability is inefficient and results in lost productivity. Because the bus system primarily operates in mixed-traffic, transit users experience the same level of travel time uncertainty as automobile users. A need exists to reduce transit travel times and provide a more reliable transit system.

1.8.3 Accessibility to new development in ‘Ewa/Kapolei/ Makakilo as a way of supporting policy to develop the area as a second urban center

Consistent with the General Plan for the City and County of Honolulu, the highest population growth rates for the island are projected in the ‘Ewa Development Plan area (comprised of the ‘Ewa, Kapolei, and Makakilo communities), which is expected to grow by 170 percent between 2000 and 2030. This growth represents nearly 50 percent of the total growth projected for the entire island. The more rural areas of Wai‘anae, Wahiawā, North Shore, Windward, Waimānalo, and East Honolulu will have much lower population growth of between zero and 16 percent if infrastructure policies support the planned growth in the ‘Ewa Development Plan area. Kapolei, which is developing as a “second city” to Downtown Honolulu, is projected to grow by nearly 600 percent to 81,100 people, the ‘Ewa neighborhood by 100 percent, and Makakilo by 125 percent between 2000 and 2030. Accessibility to the overall ‘Ewa Development Plan area is currently severely impaired by the congested roadway network, which will only get worse in the future. This area is less likely to develop as planned unless it is accessible to Downtown and other parts of O‘ahu; therefore, the ‘Ewa, Kapolei, and Makakilo area needs improved accessibility to support its future growth as planned.

1.8.4 Improved transportation equity for all travelers

Many lower-income and minority workers live in the corridor outside of the urban core and commute to work in the Primary Urban Center Development Plan area. Many lower-income workers also rely on transit because of its affordability. In addition, daily parking costs in Downtown Honolulu are among the highest in the United States, further limiting this population’s access to Downtown. Improvements to transit capacity and reliability will serve all transportation system users, including moderate- and low-income populations.

2 Alternatives Considered

This section summarizes the development and evaluation of alternatives considered for the Honolulu High-Capacity Transit Corridor Project (HHCTCP). The alternatives evaluated in this Environmental Impact Statement (EIS) resulted from a rigorous Alternatives Analysis (AA) process that culminated in the selection of a Locally Preferred Alternative (LPA) by the City and County of Honolulu Council on December 22, 2006. The selection was signed into law by the Mayor on January 6, 2007, thereby becoming Ordinance 07-001, which selects a fixed-guideway transit system extending from Kapolei to UH Mānoa with a connection to Waikīkī.

2.1 Alternatives Screening and Selection Process

During the fall of 2005 and winter of 2006, the City and County of Honolulu conducted an alternatives screening that is documented in the *Honolulu High-Capacity Transit Corridor Project Alternatives Screening Memorandum* (DTS, 2006a). The alternatives screening was approached through a top-down analysis completed in five major steps. The first step was to gather input needed for the analysis. The input included the purpose and need for the project, past studies and their recommendations, requirements of the U.S. Federal Transit Administration (FTA) process, adopted community and area plans, and a visual assessment of the entire corridor as it currently exists. The second step used the information gathered to identify a comprehensive list of potential alternatives. The third step included developing screening criteria and undertaking the initial screening of all potential alternatives to identify those that address the needs of the corridor and do not have any "fatal flaws." The fourth step was a presentation of the viable alternatives to the public and interested public agencies and officials for comment through a scoping process. Finally, input from the scoping process was collected and analyzed, and refinements were made to the alternatives. Once the evaluations were completed, the modal, technology, and alignment options were combined to create the alternatives that were evaluated in the *Honolulu High-Capacity Transit Corridor Project Alternatives Analysis Report* (DTS, 2006b).

After review of the *Alternatives Analysis Report* and consideration of public comments, the City and County of Honolulu Council selected an LPA that was signed into law by the Mayor, becoming Ordinance 07-001. The ordinance authorizes the City to proceed to planning and engineering of a fixed guideway project from Kapolei to the University of Hawai'i (UH) Mānoa with a connection to Waikīkī. The City Council also passed City Council Resolution 07-039 that directed the first construction project (First Project) be fiscally constrained to anticipated funding sources. The First Project was defined as extending from East Kapolei to Ala Moana Center via Salt Lake Boulevard.

The FTA and the City and County of Honolulu Department of Transportation Services (DTS) issued a notice of intent to prepare this EIS in the *Federal Register* on March 15, 2007.

All interested individuals and organizations, and federal, state, and local agencies were invited to comment on the purpose of and needs to be addressed by the project; the alternatives, including the modes and technologies to be evaluated and the alignments and termination points to be considered; and the environmental, social, and economic impacts to be analyzed. Scoping activities per Hawai'i Revised Statutes Chapter 343 were completed in December 2005 and January 2006.

The alternatives evaluated in this EIS are the result of this alternatives development process and reflect comments received during the scoping process, as summarized in the *Honolulu High-Capacity Transit Corridor Project National Environmental Policy Act Scoping Report* (DTS, 2007).

2.2 Alternatives Considered but Rejected

The following alternatives were eliminated before undertaking the Honolulu High-Capacity Transit Corridor Project Alternatives Analysis (DTS, 2006b).

The tunnel crossing of Pearl Harbor was rejected because it would not provide an alternative to private automobile use or improve links within the study corridor, as it would bypass much of the corridor and not provide any new connections within the remainder of the corridor.

Waterborne ferry service was eliminated as a primary transit system because its capacity and travel times were not competitive with other alternatives. This alternative was being studied as an augmentation to the existing transit system as part of a separate project. Ferry service was implemented in 2007, providing an additional transit option for travelers in the corridor. The implemented system provides substantially less capacity and longer travel time than needed for the High-Capacity Transit Corridor Project.

Several transit technologies were eliminated for various reasons. Diesel multiple unit was eliminated based on technical maturity, supplier competition, and environmental performance. Personal rapid transit was eliminated based on lack of technical maturity and line capacity. Commuter rail was eliminated because it is not suited for short station spacing and is not competitive in an urban transit enviornment. Also, emerging rail concepts were eliminated because of their lack of technical maturity and the rapid implementation schedule for the project.

For the Fixed Guideway Alternative screening analysis, the corridor was divided into sections. Within each of the sections, the alignments that demonstrated the best performance related to mobility and accessibility, supporting smart growth and economic development, constructability and cost, community and environmental quality, and planning consistency were retained for evaluation in the Alternatives Analysis.

Four alternatives were retained in the Alternatives Analysis: No Build Alternative, Transportation System Management (TSM) Alternative, Managed Lane Alternative, and Fixed Guideway Alternative. The comparison of alternatives presented in the *Honolulu High-Capacity Transit Corridor Project Alternatives Analysis Report* (DTS, 2006b) summarized that the TSM Alternative would provide little benefit, but also at a very low cost, and that the Managed Lane Alternative would provide slightly more benefit, but at a substantial cost. These alternatives were eliminated when the City and County of Honolulu Council selected a fixed-guideway transit system extending from Kapolei to UH Mānoa with a connection to Waikīkī as the Locally Preferred Alternative.

In addition to suggestions for reconsideration of previously eliminated alternatives, two separate alternatives were proposed during the National Environmental Policy Act (NEPA) scoping process and documented in the *Honolulu High-Capacity Transit Corridor Project National Environmental Policy Act Scoping Report* (DTS, 2007). One comment suggested providing additional bus service with either school buses or private vehicles. The second suggested a High Speed Bus Alternative that would include aspects of both the Managed Lane Alternative that was eliminated during the planning alternatives analysis process and the Fixed Guideway Alternative.

Providing additional bus service with either school buses or private vehicles represent variations on the TSM Alternative that would provide additional bus capacity using different vehicles or be limited to only certain times of day; it does not differ structurally from the TSM Alternative. As a result, providing additional bus service with school buses or private vehicles would not provide substantial benefit when compared to the TSM Alternative already evaluated, and it is not included in this EIS.

Constructing an elevated bus facility with multiple access points for the entire length of the Fixed Guideway Alternative would be more costly and have more severe impacts to many elements of the environment because of its increased width, both for the entire length of the system as compared to the Fixed Guideway Alternative and at stations where the width would approach 100 feet. These impacts would be similar to those of the Two-Direction Managed Lane Alternative described in the Alternatives Analysis but would extend for the entire length of the corridor from Kapolei to UH Mānoa. Substantial right-of-way would be required to accommodate the structure through urban Honolulu, including additional right-of-way for the additional proposed ramps. This alternative is not included in this EIS.

The NEPA scoping report requested input on five transit technologies. The comments received did not substantially differentiate any of the considered technologies as being universally preferable to the other technologies. Subsequent to the scoping process, the City undertook a technical review process to select the transit technology best suited for the Honolulu High-Capacity Transit Corridor Project. The process included a broad request for information that was publicized to the transit industry. Transit vehicle manufacturers submitted twelve responses, detailing the features of the vehicle technologies that they offer. These were reviewed by an expert panel that ranked the performance, cost and reliability of the proposed technologies. On March X, 2008, the City Council accepted the panels recommendations and eliminated the following technologies from further consideration:

- Tech 1
- Tech 2

2.3 Alternatives Evaluated in this Environmental Impact Statement

Four alternatives are evaluated in this EIS. They were developed through a screening process that considered alternatives identified through previous transit studies, a field review of the study corridor, an analysis of current population and employment data for the corridor, a literature review of technology modes, work completed by the O‘ahu Metropolitan Planning Organization (OMPO) for its *2030 O‘ahu Regional Transportation Plan* (OMPO, 2006a), a rigorous Alternatives Analysis process, and public and agency comments received during the separate formal project scoping processes held to satisfy NEPA requirements and the Hawai‘i EIS Law (Chapter 343). The alternatives evaluated are as follows:

1. No Build Alternative
2. Fixed Guideway Transit Alternative via Salt Lake Boulevard
3. Fixed Guideway Transit Alternative serving the Airport
4. Fixed Guideway Transit Alternative serving the Airport and Salt Lake

2.3.1 No Build Alternative (Alternative 1)

The No Build Alternative includes existing transit and highway facilities and committed transportation projects anticipated to be operational by 2030. Committed transportation projects are those identified in the *2030 O‘ahu Regional Transportation Plan* prepared by OMPO (OMPO 2006). Highway elements of the No Build Alternative also are included in the build alternatives.

The No Build Alternative's transit component would include an increase in fleet size to accommodate growth, allowing service frequencies to remain the same as today (Table 2-1).

Table 2-1. Transit Vehicle Requirements

2.3.2 Build Alternatives

The Fixed Guideway Alternatives would include the construction and operation of a grade-separated fixed-guideway transit system between Kapolei and UH Mānoa with a branch line to Waikīkī (Figure 2-1 to Figure 2-4). The system would use____________ technology and could be either automated or employ drivers. All parts of the system would either be elevated or in exclusive right-of-way.

Figure 2-1. Fixed Guideway Transit Alternative Features (Kapolei to Fort Weaver Road)

Figure 2-2. Fixed Guideway Transit Alternative Features (Fort Weaver Road to Aloha Stadium)

Figure 2-3. Fixed Guideway Transit Alternative Features (Aloha Stadium to Kalihi)

Figure 2-4. Fixed Guideway Transit Alternative Features (Kalihi to UH Mānoa)

The guideway would follow the same alignment for all Build Alternatives through most of the project corridor. Beginning at the Waiʻanae end of the corridor, the alignment would follow Kapolei Parkway to Wākea Street, and then turn makai to Saratoga Avenue. Proposed station locations and other project features in this area are shown in Figure 2-1. The guideway would continue on future extensions of Saratoga Avenue and North-South Road, and follow North-South Road and other future roadways to Farrington Highway. The guideway would follow Farrington Highway Koko Head on an elevated structure and continue along Kamehameha Highway to the vicinity of Aloha Stadium (Figure 2-2).

Between Aloha Stadium and Kalihi, the alignment differs for each of the alternatives, as detailed later in this section (Figure 2-3). Koko Head of Middle Street, the guideway would follow Dillingham Boulevard to the vicinity of Kaʻaahi Street, and then turn Koko Head to connect to Nimitz Highway in the vicinity of Iwilei Road.

The alignment would follow Nimitz Highway Koko Head to Halekauwila Street, then along Halekauwila Street past Ward Avenue where it would transition to Queen Street and the new Queen Street Extension alignment. Property on the mauka side of Waimanu Street would be acquired to allow the alignment to cross over to Kona Street. The guideway would run above Kona Street through Ala Moana Center and then turn mauka to follow Kapiʻolani Boulevard to University Avenue where it would again turn mauka to follow University Avenue over the H-1 Freeway to a proposed terminal facility in UH Mānoa's Lower Campus. A branch line with a transfer point at Ala Moana Center or the Hawaiʻi Convention Center into Waikīkī would follow Kalākaua Avenue to Kūhiō Avenue, and then extend along Kūhiō Avenue to the vicinity of Kapahulu Avenue (Figure 2-4).

In addition to the guideway, the project will require the construction of stations and supporting facilities. Supporting facilities include a vehicle maintenance facility, transit centers, park-and-ride lots, and traction-power sub-stations. The vehicle maintenance facility would either be located between North-South Road and Fort Weaver Road or near Leeward Community College (Figure 2-1 and

Figure 2-2). Some bus service would be reconfigured to bring riders on local buses to nearby fixed-guideway transit stations. To support this system, the bus fleet would be increased.

Operating Parameters

The fixed guideway system is planned to operate between 4 a.m. and midnight (Table 2-2), with a train arriving in each direction at each station between every three and ten minutes. The system is planned to operate with a unified fare structure with TheBus, with transfers and passes usable on both systems. A possible fare-collection system would include one that operates on an honor basis. No gates or fare inspection points would be used in the stations. Fare machines would be available at all stations, and standard fare boxes would be used on buses. Fare inspectors would randomly ride the system and check that passengers have valid tickets or transfers. Violators would be cited and fined.

Table 2-2. Fixed Guideway Operating Assumptions

Time of Day[1]	System Headway[2]
4 a.m. to 6 a.m.	6 minutes
6 a.m. to 9 a.m.	3 minutes
9 a.m. to 3 p.m.	6 minutes
3 p.m. to 6 p.m.	3 minutes
6 p.m. to 8 p.m.	6 minutes
8 p.m. to 12 a.m.	10 minutes

[1]System is closed from 12 a.m. to 4 a.m.
[2]Branch-line headway to Waikīkī and UH Mānoa would be twice that of the main line.

The system is planned to operate with multi-vehicle consists (groupings of fixed-guideway vehicles) approximately 175 to 200 feet in length, with each train capable of carrying a minimum of 300 passengers. This would provide a peak capacity of at least 6,000 passengers per hour per direction. The system would be expandable to longer trains of up to 300 feet in the future to increase capacity by 50 percent. Also, the system could be operated with shorter headways (time between train arrivals) to increase peak capacity.

The build alternatives all assume completion of the committed transportation projects identified in the O‘ahu 2030 Regional Transportation Plan prepared by OMPO, as described for the No Build Alternative.

Project Phasing

The First Project is a portion of the overall project that would provide a fixed-guideway transit system between Kapolei and UH Mānoa with a branch line to Waikīkī that would begin in the vicinity of the planned UH West O‘ahu campus and extend to Ala Moana Center. This is a portion of the overall project that can be constructed with reasonably anticipated funding. The remainder of the alternative would be constructed once additional funding is secured.

The First Project would be constructed in a series of construction phases. The first phase of construction would be the portion of the project between the Waianae end of the First Project and Leeward Community College. This phase also would include construction of the vehicle maintenance and storage facility. The remainder of the First Project would be built in overlapping phases continuing Koko Head from Leeward Community College.

Fixed Guideway Transit Alternative via Salt Lake Boulevard (Alternative 2)

The Fixed Guideway Transit Alternative via Salt Lake Boulevard would leave Kamehameha Highway immediately Ewa of Aloha Stadium, cross the Aloha Stadium parking lot, and continue Koko Head along Salt Lake Boulevard (Figure 2-3). It would follow Pukoloa Street through Mapunapuna before turning makai and following Moanalua Stream and crossing the H-1 Freeway to the Middle Street Transit Center. Two options for station locations along the Salt Lake Boulevard alignment have been evaluated. Both options would include a station at Aloha Stadium near Kahuapa‘ani Street.

First Project

The First Project for the Fixed Guideway Transit Alternative via Salt Lake Boulevard would begin near the planned UH West O‘ahu campus and extend to Ala Moana Center following Salt Lake Boulevard.

Fixed Guideway Transit Alternative Serving the Airport (Alternative 3)

The Fixed Guideway Transit Alternative Serving the Airport would continue along Kamehameha Highway makai past Aloha Stadium to Nimitz Highway and turn makai onto Aolele Street and then follow Aolele Street Koko Head to reconnect to Nimitz Highway near Moanalua Stream and continuing to the Middle Street Transit Center (Figure 2-3). Stations would be constructed at Aloha Stadium, Pearl Harbor Naval Base, Honolulu International Airport, and Lagoon Drive.

First Project

The First Project for the Fixed Guideway Transit Alternative Serving the Airport would begin near the planned UH West O‘ahu campus and extend to Ala Moana Center following the Kamehameha Highway to Aolele Street alignment described above.

Fixed Guideway Transit Alternative Serving the Airport and Salt Lake (Alternative 4)

The Fixed Guideway Transit Alternative Serving the Airport and Salt Lake is identical to the Fixed Guideway Transit Alternative via Salt Lake Boulevard, with the exception of also including a future fork in the alignment following Kamehameha Highway and Aolele Street at Aloha Stadium that rejoins at Middle Street. The station locations discussed for the Fixed Guideway Transit Alternative via Salt Lake Boulevard would all be provided as part of this alternative. Similarly, all the stations discussed for the Fixed Guideway Transit

Alternative Serving the Airport also would be constructed at a later phase of the project; however, the Aloha Stadium Station would be relocated makai to provide a Pearl Harbor Memorial Station instead of a second Aloha Stadium Station. At the Middle Street Transit Center Station, each line would have a separate platform with a pedestrian connection between them to allow passengers to transfer (Figure 2-3).

First Project

The First Project for the Fixed Guideway Transit Alternative Serving the Airport and Salt Lake would be identical to the First Project of the Fixed Guideway Transit Alternative via Salt Lake because the alignment serving the airport would be added as a future extension.

Features Common to All Build Alternatives

Transit Technology

Station Characteristics

Bus System Connections

Park-and-Ride Lots

Vehicle Maintenance and Storage Facility

Traction Power Substations

Construction Process

2.4 Project Schedule

2.5 Project Costs

2.5.1 Capital Costs

2.5.2 Operating and Maintenance Costs